

Analyze

Looking for the root cause

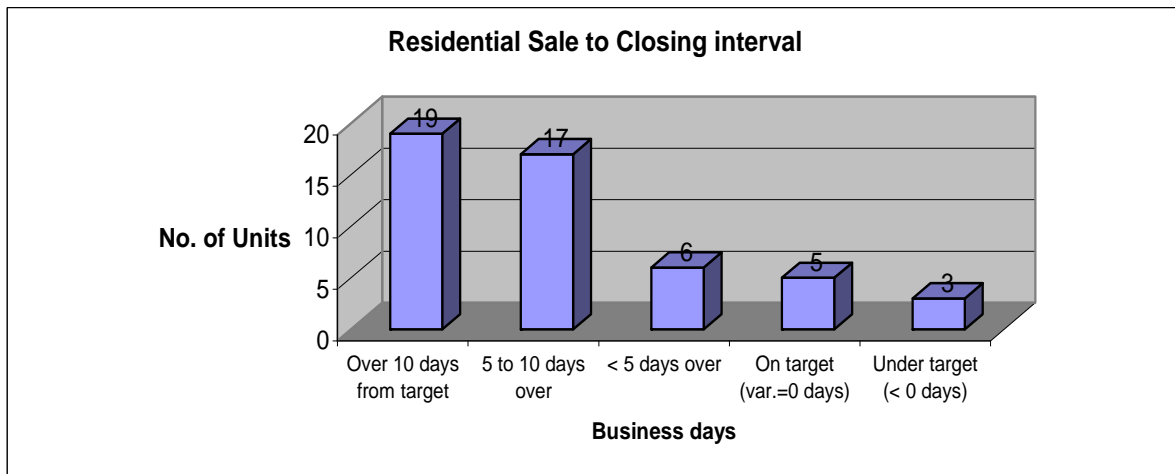
Process Stratification and Analysis

Objective is to analyze the process in detail to clearly define a specific problem on which to concentrate root cause analysis and ultimately resolve. Pareto Analysis attempts to identify the 'vital few' processes where there are problems that impact business outcomes the most. Each Pareto categorizes and displays the data to answers key questions. Answers to these questions progressively will get us closer to determining the specific problem upon which root cause analysis is based.

PARETO 1 How many units missed the Sale to Closing target?

| Sale to Closing | # Units |
|--------------------------|---------|
| Over 10 days from target | 19 |
| 5 to 10 days over | 17 |
| < 5 days over | 6 |
| On target (var.=0 days) | 5 |
| Under target (< 0 days) | 3 |

Sale Contract to Closing target is 3.0 months (65 days)

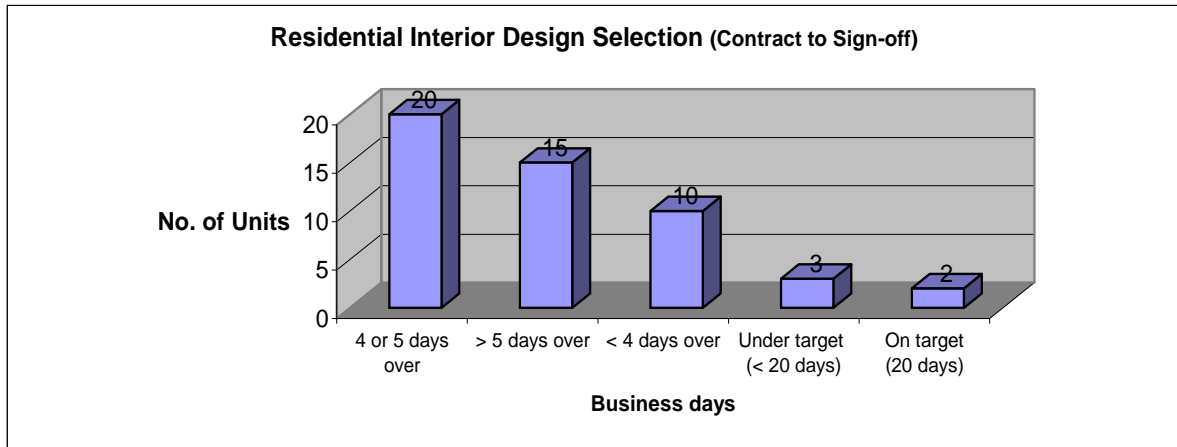


Most, 84% of units, missed the Closing target. Pareto chart 2 shows that 90% of units missed the design selection sign-off target.

PARETO 2 How many units missed the interior design selection sign-off target?

| Contract to Sign-off | # Units |
|--------------------------|---------|
| 4 or 5 days over | 20 |
| > 5 days over | 15 |
| < 4 days over | 10 |
| Under target (< 20 days) | 3 |
| On target (20 days) | 2 |

Contract to Interior Design Selection sign-off target is 4 weeks (20 days)

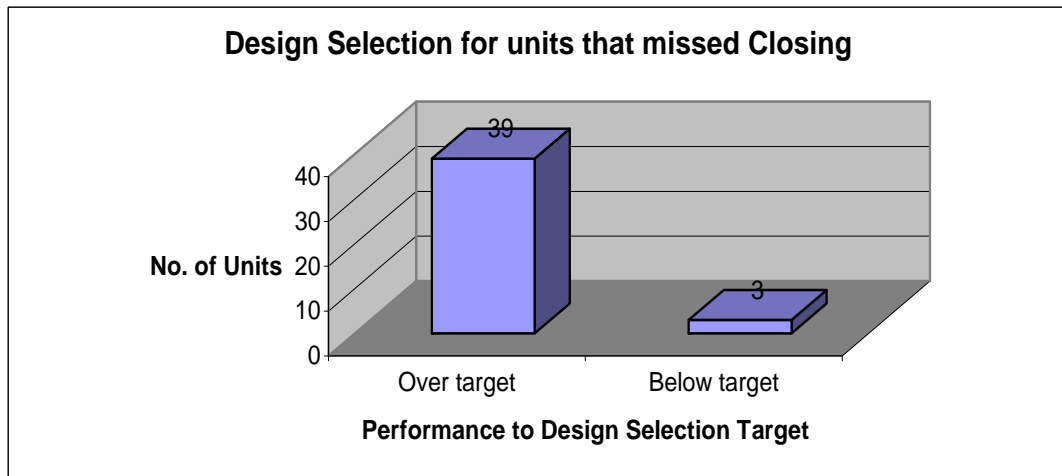


Pareto Analysis is a useful tool to display data in a way that directs to key problem areas. Is there a correlation between Design Selection and Sale to Closing intervals?

PARETO 3: How many units that missed the Closing target, also missed design selection sign-off target? *Stratification of Pareto chart 1*

| Contract to Sign-off | # Units |
|----------------------|---------|
| Over target | 39 |
| Below target | 3 |

Contract to Interior Design Selection sign-off target is 4 weeks



For these 39 units that also missed the design selection target, what were the feature issues?

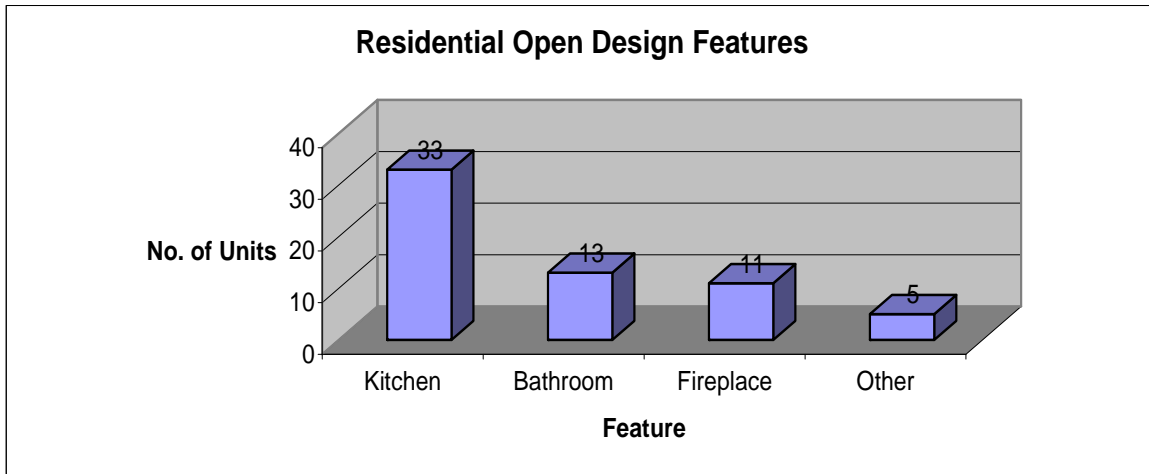
PARETO 4: What features were not signed-off after the design selection target was exceeded?

| Feature Category | # Units |
|------------------|---------|
| Kitchen | 33 |
| Bathroom | 13 |
| Fireplace | 11 |
| Other | 5 |

Stratification of Pareto chart 3

Units with features open (not signed-off) after target date of 4 wks.

The highest percentage is 85% units have open kitchen selections. These units could also have open features in other categories. Thus, the phrase 'at least 85%' in the problem statement. Bathroom and Fireplace categories also indicate significant issues. Therefore, they are grouped with kitchen issues in the problem statement



Stratifying the data gives us the information needed to determine a problem statement which describes what the data reveals, summarizes findings and presents the undesirable state.

Problem Statement 1

Data shows that 93% of unit closings that exceeded the target interval of 3 months, also exceeded interval target for start design selection process to completion of that process (20 days). At least 85% of these late design selection periods are attributed to non-selection relating to kitchen, bathrooms and fireplace.

The combination of design selection being a big contributor to meeting the Sale to Closing CCR of 3 months and low Sigma (0.80) for this process focuses problem resolution in this direction to achieve maximum business impact.

| Sigma | Big Contributor | Low contributor |
|----------------------------------|--|---|
| High Sigma <i>Few Defects</i> | Use impact (defects vs. target) to determine whether to work on these problems | Don't bother with these problems at this time |

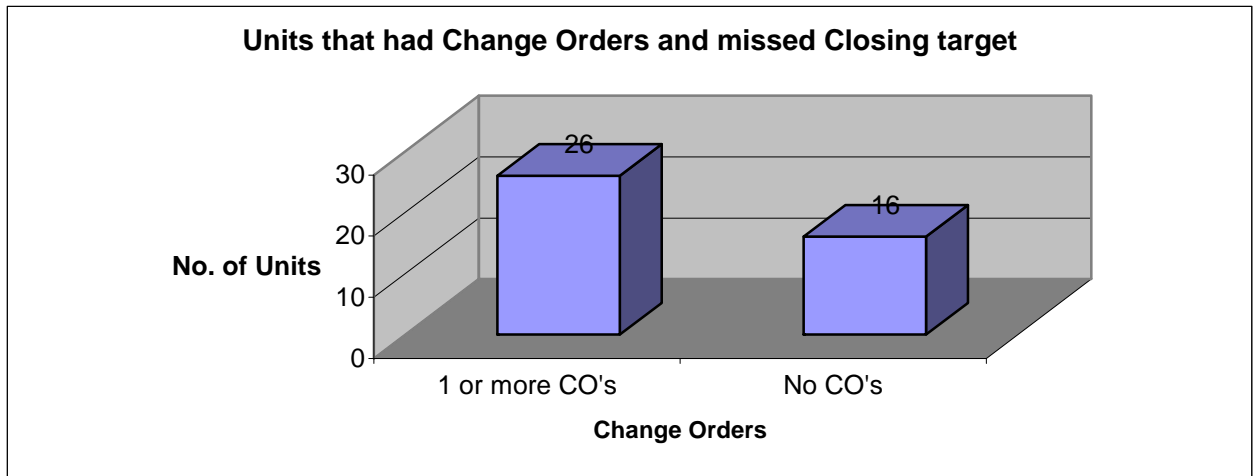


| | | |
|----------------------------------|-------------------------------------|--|
| Low Sigma <i>Many Defects</i> | Work on these problems first | Use impact (defects vs. target) to determine whether to work on these problems |
|----------------------------------|-------------------------------------|--|

We, also, want to determine if change orders are linked to missing the closing target and, if so, to which feature types are they related. Additional stratifications of the data will direct us to key problem areas.

PARETO 5: For units that exceeded the Closing target, which ones had build-out phase change orders? *Stratification of Pareto chart 1*

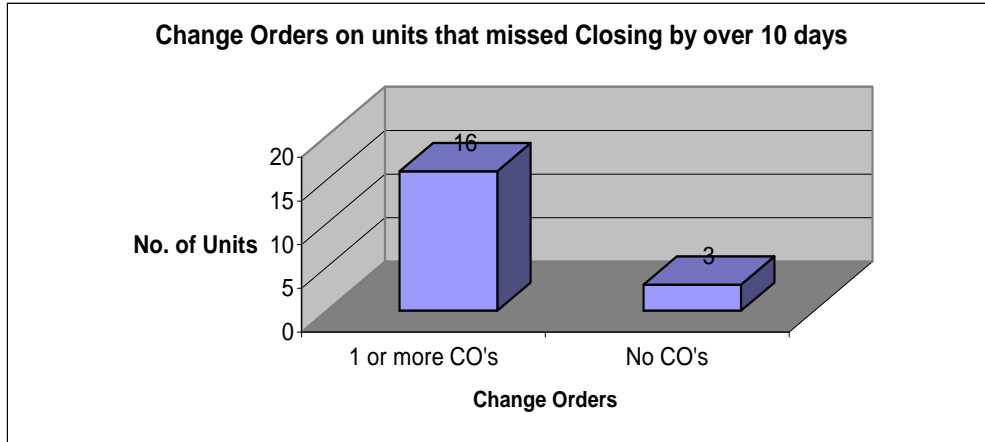
| Over Sale to Closing target | # Units |
|-----------------------------|---------|
| 1 or more CO's | 26 |
| No CO's | 16 |



Not too bad (62%), but what about those that exceeded target by the most. For the 19 units that missed Closing target most severely, how many had change orders?

PARETO 6: How many units that exceeded the Closing target by more than 10 days had change orders? *Stratification of Pareto chart 1*

| Over target > 10 days | # Units |
|-----------------------|---------|
| 1 or more CO's | 16 |
| No CO's | 3 |



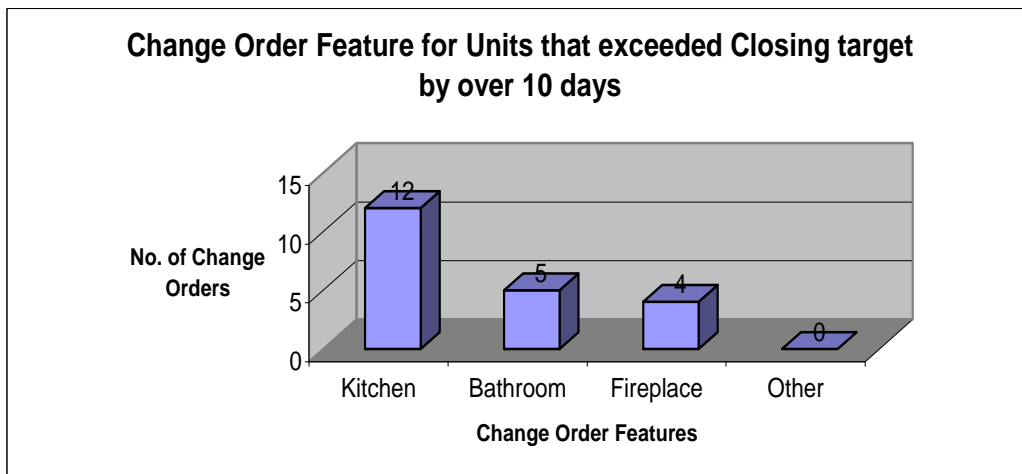
Over 84% had change orders. What feature types should we focus on?

PARETO 7: For units that exceeded Closing target by more than 10 days and had change orders, what feature categories were they?

Stratification of Pareto chart 6

| Change Order Feature | # Units |
|----------------------|---------|
| Kitchen | 12 |
| Bathroom | 5 |
| Fireplace | 4 |
| Other | 0 |

* * Note: units had 1 or more change orders, thus sum greater than 16



Problem Statement 2

Data shows that 62% of units exceeding the sale to closing target also had at least 1 change order. Over 84% of those that exceeded Closing target by over 10 days had change orders. All (100%) were kitchen, bathroom or fireplace design selections.

Problems identified, what do we want to achieve?

Goals for Problem Statements

Buyer achieves quality design selections for kitchen, bath & fireplaces within the targeted 20 day selection period for 85% of units, 80% of which do not have related change orders.

Through these two problem statements we have created the focus required to accomplish root cause identification.

Determine Root Cause

Data revealed the true situation from which problem statements were derived. A common factor between the two problem statements lies in the kitchen, bath and fireplace design selections. This premise is the basis for our search for a root cause. In that pursuit we determine the underlying source of defects, so a solution can be designed to eliminate the defects permanently.

We want to seek input from as many resources as possible to surmount the obstacles to identifying the root cause. Perhaps the most useful tool for identifying root causes is the Ishikawa (cause and effect – fish bone) diagram. The fish-bone is a visual tool for organizing information to establish and clarify the relationships between an effect and its main causes.

Sales Managers, Executive Team members and the Six Sigma Project Manager met to develop a fishbone diagram. Major categories use major activities as detailed in the functional deployment process map. We started with the ‘most likely’ major category and asked ‘why’ does this defect occur or condition exist until we reached an ‘actionable’ conclusion.

We started with the major causes of the defect and created the branches.

- Sales / Buyer information exchange
- Design Selection process

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- Sales / Construction information exchange
- Construction quoting process
- Vendor quoting process

Ultimately we chose “Sales / Buyer information exchange” as the ‘most likely’ major category to cause the defect. Following questions were used to drill down to root cause and answers documented on the fish-bone diagram.

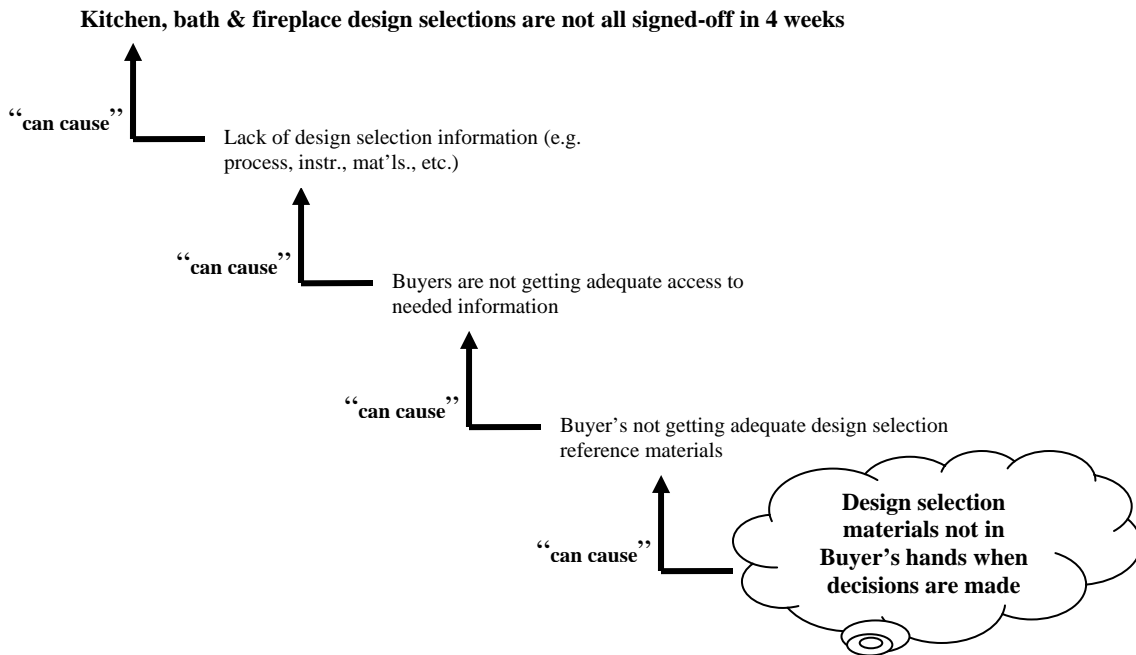
- **LEVEL 1:** Are Buyer’s aware of all needs to avoid potential push-outs to schedule?
 - **Symptom 1:** Lack of design selection information is the key response on the path to the root cause.
- **LEVEL 2:** Why can’t Buyer get required information to make informed design selection decisions?
 - **Symptom 2:** Four responses pointed to the Buyer not having needed access to design selection information.
- **LEVEL 3:** Why are the modes and methods designed to get the Buyer needed information not performing to the level required?
 - **Symptom 3:** The Buyer’s are not getting adequate materials to make quality design selection decisions.
- **LEVEL 4:** Why aren’t adequate design selection materials available for the Buyer?
 - **Root Cause:** *Buyer’s don’t have the reference materials available when likely off-hour decisions are made.*

Some responses were ancillary concerns and by-products of a solution to the core root cause are likely to address them (e.g. schedule impacts for build-out phase change orders as a result of low quality design selection decisions).

Following is the re-phrased root cause with effects included.

Quality selection materials are not in the Buyer’s hands off-hours when Buyer decisions are made impacting time frame of sign-offs which correlate to closing schedule and are linked to high impact (*cost and schedule*) build-out phase change orders.

To verify root cause use reverse logic to ensure a solid relationship between cause and effect.



There is always more than one right answer. In our search for the root cause, we identified alternative root causes. But, determined that this root cause was of highest priority and should be addressed first. However, solutions identified during initial brainstorming during procedure collection when developing the functional deployment process map of the Sales process were submitted to the Executive Team. As part of the continuous improvement program future Six Sigma projects should address these root causes and draw on the ideas brainstormed.